

AMENDMENTS TO THE DRAWINGS

Please substitute new Figure 3 to correct a labeling error. Attached is a Replacement Sheet, as well as an Annotated Marked-Up Drawing.

REMARKS

Applicants respectfully request reconsideration of this application. Claims 1, 5, 8, 9, 12, 15, 16, 20, 22, 23, and 24 have been amended. No claims have been added. Claims 4, 7, 11, 14, 19, and 21 have been canceled.

Allowable Subject Matter

Applicants thank the Examiner for allowing claim 25.

The Examiner indicated that claims 4-6, 8, 11-13, 15, 19, 20, and 22 would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claim 4 depended directly from claim 1. In this response, Applicants have amended claim 1 to include the limitation of claim 4. Therefore, Applicants respectfully submit that claim 1 is in condition for allowance. Claims 2-3 and 5-6 depend, directly or indirectly, from claim 1. Therefore, Applicants respectfully submit that claims 2-3 and 5-6 are also in condition for allowance.

Claim 8 depended from claims 1 and 7. In this response, Applicants have canceled claim 7 and amended claim 8 to include the previous limitations of claims 1 and 7. Therefore, Applicants respectfully submit that claim 8 is also in condition for allowance.

Claim 11 depended directly from claim 9. In this response, Applicants have amended claim 9 to include the limitation of claim 11. Therefore, Applicants respectfully submit that claim 9 is in condition for allowance. Claims 10 and 12-13 depend, directly or indirectly, from claim 9. Therefore, Applicants respectfully submit that claims 10 and 12-13 are also in condition for allowance.

Claim 15 depended from claims 9 and 14. In this response, Applicants have canceled claim 14 and amended claim 15 to include the previous limitations of claims 9 and 14. Therefore, Applicants respectfully submit that claim 15 is also in condition for allowance.

Claim 19 depended directly from claim 16. In this response, Applicants have amended claim 16 to include the limitation of claim 19. Therefore, Applicants respectfully submit that claim 16 is in condition for allowance. Claims 17-18 and 20 depend from claim 16. Therefore, Applicants respectfully submit that claims 17-18 and 20 are also in condition for allowance.

Claim 22 depended from claims 16 and 21. In this response, Applicants have canceled claim 21 and amended claim 22 to include the previous limitations of claims 16 and 21. Therefore, Applicants respectfully submit that claim 22 is also in condition for allowance.

Rejections under 35 U.S.C. §102

Examiner rejected claim 23 as being anticipated by U.S. Patent Publication No. 2002/0163072 to Gupta et al.

Applicants have amended claim 23 to include the limitation of “providing a barrier structure between outer regions of the opposing surfaces to protect the plurality of bonded metallic lines from contamination during wafer thinning.” Gupta does not disclose or suggest this limitation.

Gupta discloses “turning element 201 over such that its copper bonding pads are positioned over the corresponding bonding pads on element 202.... The two component elements are pressed together and bonded using thermal diffusion bonding. The wafers are bonded by compressing the two wafers using 20-60 psi pressure at 300-450°C temperature in a nitrogen or air atmosphere for 5-50 minutes. The wafers are positioned by utilizing fiducial marks on the front sides of the wafers. The marks on the front side of wafer 202 are viewed from the backside of the wafer. To improve the accuracy of the alignment, wafer 202 may be thinned prior to bonding.” (Gupta, para. 0030).

Gupta does not disclose or suggest providing a barrier structure between outer regions of opposing surfaces of the component elements to protect bonded metallic lines from contamination during wafer thinning. Therefore, Gupta does not disclose or suggest the limitation in claim 23 of “providing a barrier structure between outer regions

of the opposing surfaces to protect the plurality of bonded metallic lines from contamination during wafer thinning."

The other references cited by the Examiner in the Office Action also do not disclose or suggest this limitation.

Fung discloses "a second type of glue material (275) is pasted at the edge of the chip near the substrate surface. This second type glue (275) mechanically secures the stacking and protects the edges from any chemical process used hereinafter." (Fung, col. 5, lines 57-61). As seen from Figures 4, 5, 6, and 9 of Fung, the glue material is not between outer regions of opposing surfaces. Furthermore, in Fung, the glue material "protects the edges from any chemical process used hereinafter." The glue material does not protect metallic lines from contamination during wafer thinning. Therefore, Fung does not disclose or suggest the limitation in claim 23 of "providing a barrier structure between outer regions of the opposing surfaces to protect the plurality of bonded metallic lines from contamination during wafer thinning."

Kurogi discloses hermetically sealing the periphery of a flip chip to a substrate by soldering. (Kurogi, Field of Invention). In Kurogi, "the contact side of the body 14 has a surrounding barrier 24, which is seen in FIG. 4 as having a solder bump 26 thereon." (Kurogi, col. 2, lines 44-46). "In order to seal the flip chip down on the substrate, a corresponding surrounding barrier 40 is positioned around the substrate corresponding to the position of barrier 24 when the flip chip is properly positioned on the substrate. Barrier 40 carries a solder bump 42 which corresponds to solder bump 26." (Kurogi, col. 3, lines 1-6). "In assembly, the parts are cleaned in the conventional ways, and the flip chip is positioned on the substrate with the barriers in line. In FIG. 4, the flip chip is brought straight down so that its outer bumps are in contact. The assembly is heated, and the solder reflows to electrically connect the contacts between the flip chip and the substrate. At the same time, the solder reflows on the barriers to completely enclose the I/O contacts."

Kurogi does not disclose or suggest that the barrier formed by soldering barrier 24 and 40 are between outer regions of opposing surfaces of the flip chip and the substrate. Kurogi also does not disclose or suggest that the barrier protects bonded

metallic lines from contamination during wafer thinning. Therefore, Kurogi also does not disclose or suggest the limitation in claim 23 of “providing a barrier structure between outer regions of the opposing surfaces to protect the plurality of bonded metallic lines from contamination during wafer thinning.”

Kurtz also does not disclose this limitation. As Examiner suggested, Kurtz is inapplicable to structures having bonded metallic lines. (Office Action, dated 07/26/2005, p. 7). Therefore, Kurtz also does not disclose or suggest the limitation in claim 23 of “providing a barrier structure between outer regions of the opposing surfaces to protect the plurality of bonded metallic lines from contamination during wafer thinning.”

Therefore, Applicants submit that claim 23 is not anticipated by Gupta or any of the other references cited by the Examiner, individually or in combination. Withdrawal of the rejection to claim 23 is respectfully requested.

Examiner rejected claim 24 as being anticipated by U.S. Patent No. 5,401,672 to Kurtz et al. Examiner stated that “claim 24 can be considered anticipated by references such as Kurtz et al, as applied supra, while claim 4 is allowable, based on the inapplicability of Kurtz to structures having bonded metallic lines or based on the fact that the semiconductor-based barrier layers of Kurtz would not necessarily provide environmental or crack propagation protection during a cleaving process.” (Office Action, dated 07/26/2005, p. 7).

Therefore, claim 24 has been amended to include the limitation of “the barrier structure protecting internal die from corrosion, contamination and crack propagation when the bonded wafers are cut into individual die.” Applicants respectfully submit that Kurtz does not disclose or suggest this limitation. Therefore, Applicants respectfully submit that Kurtz does not anticipate claim 24 and respectfully request withdrawal of the rejection to claim 24 under § 102.

Rejections under 35 U.S.C. §103

Examiner rejected claims 1, 2, 7, 9, 10, 14, 16-18, and 21 under 35 U.S.C. §

103(a) as being unpatentable over U.S. Patent No. 6,355,501 to Fung et al. in view of U.S. Patent No. 5,699,611 to Kurogi et al.

Independent claims 1, 9, and 16 have been amended as indicated above to be placed in condition for allowance as directed by the Examiner. Therefore, Applicants respectfully request withdrawal of the rejections of claims 1, 9, and 16 under §103.

Claims 2, 10, and 17-18 depend, directly or indirectly, from one of the foregoing independent claims. Claims 7, 14, and 21 have been canceled. Therefore, Applicants respectfully request withdrawal of the rejections of claims 2, 7, 10, 14, 17-18, and 21 under §103.

Examiner rejected claim 3 under 35 U.S.C. § 103(a) as being unpatentable over Fung in view of Kurogi, and further in view of Gupta et al. Claim 3 depends from now allowable claim 1. Therefore, Applicants respectfully submit that claim 3 is also in condition for allowance. Withdrawal of the rejection to claim 3 under § 103 is respectfully requested.

CONCLUSION

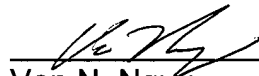
Applicant respectfully submits that the claims are in condition for allowance.

Pursuant to 37 C.F.R. 1.136(a)(3), Applicants hereby request and authorize the U.S. Patent and Trademark Office to (1) treat any concurrent or future reply that requires a petition for extension of time as incorporating a petition for extension of time for the appropriate length of time and (2) charge all required fees, including extension of time fees and fees under 37 C.F.R. 1.16 and 1.17, to Deposit Account No. 02-2666.

Respectfully submitted,

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Date: 10/25/05



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Annotated Marked-Up Drawing

FIG. 3

